

CLAIMS

1. A printer for performing correction to improve the quality of images represented by input binary black and for printing the images,

5 comprising an image-quality corrector unit for detecting second irregular patterns that are represented by data included in the input black and white pixel data and that are specific to an error-variance method, wherein said image-quality

10 corrector unit detects at least one type of substantially vertical vertical-line irregular patterns, substantially horizontal horizontal-line irregular patterns, and thin-line patchy patterns to thereby smooth the detected second irregular

15 patterns.

2. The printer according to claim 1, wherein said image-quality corrector unit sequentially inputs the black and white pixel data representing groups of an attention pixel and a plurality of peripheral pixels, and compares the input data to the irregular patterns registered; and when pattern-matching is detected, said image-quality corrector unit performs area gradation correction for converting an area at a predetermined position 20 in an n-divisional pixel (n = natural number) of the attention pixel and a predetermined number of intrapixel divisional areas to black areas.

3. A printer for performing correction to improve the quality of images represented by input binary black and for printing the images, comprising an image-quality corrector unit for 5 detecting isolated pixels that are specific to error-variance method and that are represented by data included in the input black and white pixel data and for distributing the detected isolated pixel to peripheral pixels to thereby reduce the 10 pixel size.

4. The printer according to claim 3, wherein said image-quality corrector unit comprises a plurality of matrix patterns having different sizes, uses the matrix patterns in the order of larger 15 sizes to detect isolated pixels, and distributes the isolated pixels to peripheral pixels according to the sizes of the matrix patterns used to detect the isolated pixels.

5. The printer according to claim 4, wherein 20 said image-quality corrector unit allows the number of distributed peripheral pixels to be increased in proportion to the increase in the size of the matrix pattern used to detect an isolated pixel, and concurrently, allows the size of a reduced 25 distribution pixel to be reduced in inverse proportion thereto.

6. The printer according to claim 3, wherein

5 said image-quality corrector unit uniformly distributes reduced pixels obtained through reduction in the size of the detected isolated pixel to peripheral pixels in a plurality of directions.

7. A printer for performing correction to improve the quality of images represented by input binary black and for printing the images, comprising:

10 a first image-quality corrector unit for detecting first irregular patterns that are represented by data included in the black and white pixel data and that are specific to binary processing (binary coding) according to a method 15 other than an error-variance method to thereby smooth the detected first irregular patterns;

18 a second image-quality corrector unit for detecting second irregular patterns that are represented by data included in the input black and 20 white pixel data and that are specific to an error-variance method, wherein said image-quality corrector unit detects at least one type of substantially vertical vertical-line irregular patterns, substantially horizontal horizontal-line 25 irregular patterns, and thin-line patchy patterns to thereby smooth the detected second irregular patterns; and

a controller unit for operating such that the black and white pixel data input to said first image-quality corrector unit is input to said second image-quality corrector unit to be processed 5 thereby when the black and white pixel data does not match one of the first irregularity detection patterns, and said first image-quality corrector unit is used to process the input black and white pixel data by interrupting processing being 10 performed by said second image-quality corrector unit when the black and white pixel data matches one of the first irregularity detection patterns.

8. The printer according to claim 7, wherein said first image-quality corrector unit and said 15 second image-quality corrector unit sequentially input the black and white pixel data representing groups of an attention pixel and a plurality of peripheral pixels, and compares the input data to the first irregular patterns and the second 20 irregularity detection patterns; and when pattern-matching is detected, said first image-quality corrector unit and said second image-quality corrector unit perform area gradation correction for converting an area at a predetermined position 25 in an n-divisional pixel (n = natural number) of the attention pixel and a predetermined number of intrapixel divisional areas to black areas.

9. The printer according to claim 7, further comprising a third image-quality corrector unit for detecting isolated pixels that are specific to the error-variance method and that are represented by
5 data included in the input black and white pixel data and for distributing the detected isolated pixel to peripheral pixels to thereby reduce the pixel size.

10. The printer according to claim 7,
10 wherein said first image-quality corrector unit comprises a plurality of matrix patterns having different sizes, uses the matrix patterns in the order of larger sizes to detect isolated pixels, and distributes the isolated pixels to peripheral
15 pixels according to the sizes of the matrix patterns used to detect the isolated pixels.

11. The printer according to claim 10,
wherein said first image-quality corrector unit allows the number of distributed peripheral pixels
20 to be increased in proportion to the increase in the size of the matrix pattern used to detect an isolated pixel, and concurrently, allows the size of a reduced distribution pixel to be reduced in inverse proportion thereto.

25 12. The printer as according to claim 7,
wherein said image-quality corrector unit uniformly distributes reduced pixels obtained through

reduction in the size of the detected isolated pixel to peripheral pixels in a plurality of directions.

13. The printer according to claim 7,
5 wherein said controller unit operates such that the black and white pixel data input to said first image-quality corrector unit is input to said second image-quality corrector unit and subsequently to said third image-quality corrector 10 unit to be processed thereby when the black and white pixel data does not match one of the first irregularity detection patterns, and said first image-quality corrector unit is used to process the input black and white pixel data by interrupting 15 processing being performed by said second image-quality corrector unit and processing being processed by said third image-quality corrector unit when the black and white pixel data matches one of the first irregularity detection patterns.

20 14. A printer for performing correction to improve the quality of images represented by input binary black and for printing the images, comprising:

a first image-quality corrector unit for 25 detecting first irregular patterns that are represented by data included in the black and white pixel data and that are specific to a method other

than an error-variance method to thereby smooth the detected first irregular patterns;

5 a third image-quality corrector unit for detecting isolated pixels that are represented by data included in the input black and white pixel data and for distributing the detected isolated pixel to peripheral pixels to thereby reduce the pixel size; and

10 a controller unit for operating such that the black and white pixel data input to said first image-quality corrector unit is input to said third image-quality corrector unit to be processed thereby when the black and white pixel data does not match one of the first irregularity detection 15 patterns, and said first image-quality corrector unit is used to process the input black and white pixel data by interrupting processing being performed by said third image-quality corrector unit when the black and white pixel data matches 20 one of the first irregularity detection patterns.

15. A printing method for performing correction to improve the quality of images represented by input binary black and for printing the images, wherein detection is performed for 25 second irregular patterns that are represented by data included in the input black and white pixel data and that are specific to an error-variance

method such that detection is performed for at least one type of substantially vertical vertical-line irregular patterns, substantially horizontal horizontal-line irregular patterns, and thin-line 5 patchy patterns to thereby smooth the detected second irregular patterns.

16. A printing method for performing correction to improve the quality of images represented by input binary black and for printing 10 the images, wherein detection is performed for isolated pixels that are specific to error-variance method and that are represented by data included in the input black and white pixel data and for distributing the detected isolated pixel to 15 peripheral pixels to thereby reduce the pixel size.

17. A printing method for performing correction to improve the quality of images represented by input binary black and for printing the images, comprising:

20 a first image-quality correction step for detecting first irregular patterns that are represented by data included in the black and white pixel data and that are specific to binary processing (binary coding) according to a method 25 other than an error-variance method to thereby smooth the detected first irregular patterns;

a second image-quality correction step for

detecting second irregular patterns that are represented by data included in the input black and white pixel data and that are specific to an error-variance method, wherein said image-quality

5 correction step detects at least one type of substantially vertical vertical-line irregular patterns, substantially horizontal horizontal-line irregular patterns, and thin-line patchy patterns to thereby smooth the detected second irregular

10 patterns; and

15 a control step for operating such that the black and white pixel data input to said first image-quality correction step is input to said second image-quality correction step to be processed thereby when the black and white pixel data does not match one of the first irregularity detection patterns, and said first image-quality correction step is used to process the input black and white pixel data by interrupting processing

20 being performed in said second image-quality correction step when the black and white pixel data matches one of the first irregularity detection patterns.

18. A printing method for performing

25 correction to improve the quality of images represented by input binary black and for printing the images, comprising:

1
2 a first image-quality correction step for
3 detecting first irregular patterns that are
4 represented by data included in the black and white
5 pixel data and that are specific to a method other
than an error-variance method to thereby smooth the
detected first irregular patterns;

6
7 a second image-quality correction step for
8 detecting second irregular patterns that are
9 represented by data included in the input black and
10 white pixel data and that are specific to an error-
variance method, wherein said image-quality
11 correction step detects at least one type of
12 substantially vertical vertical-line irregular
13 patterns, substantially horizontal horizontal-line
14 irregular patterns, and thin-line patchy patterns
15 to thereby smooth the detected second irregular
patterns;

16
17 a third image-quality correction step for
18 detecting isolated pixels that are represented by
19 data included in the input black and white pixel
20 data and for distributing the detected isolated
pixel to peripheral pixels to thereby reduce the
pixel size; and

21
22 a control step for operating such that the
23 black and white pixel data input to said first
24 image-quality correction step is input to said
25 third image-quality correction step to be processed

therein when the black and white pixel data does not match one of the first irregularity detection patterns, and said first image-quality correction step is used to process the input black and white
5 pixel data by interrupting processing being performed in said second image-quality correction step and said third image-quality correction step when the black and white pixel data matches one of the first irregularity detection patterns.

10 19. A printing method for performing correction to improve the quality of images represented by input binary black and for printing the images, comprising:

an image-quality correction step for
15 detecting irregular patterns that are represented by data included in the black and white pixel data and that are specific to a method other than an error-variance method to thereby smooth the detected irregular patterns;

20 a pixel-distribution step for detecting isolated pixels that are represented by data included in the input black and white pixel data and for distributing the detected isolated pixel to peripheral pixels to thereby reduce the pixel size;

25 and

a control step for operating such that the black and white pixel data input to said image-

quality correction step is input to said pixel-distribution step to be processed therein when the black and white pixel data does not match one of the first irregularity detection patterns, and said

5 image-quality correction step is used to process the input black and white pixel data by interrupting processing being performed in said pixel-distribution step when the black and white pixel data matches one of the first irregularity

10 detection patterns.

20. A printer for performing correction to improve the quality of images represented by input binary black and white pixel data for printing the images, comprising:

15 a scale-varying processor unit for varying the size of an original image optically scanned to a predetermined image size by performing pixel-removal processing;

20 a binary unit for converting the size-varied image into black and white pixel data according to an error-variance method; and

25 an image-quality corrector unit for detecting irregular patterns that are represented by data included in the black and white pixel data and that are specific to an error-variance method, wherein said image-quality corrector unit detects at least one type of substantially vertical vertical-line

irregular patterns caused through the pixel-removal processing, substantially vertical vertical-edge irregular patterns, substantially horizontal horizontal-line irregular patterns, substantially 5 horizontal horizontal-edge irregular patterns; and thin-line patchy patterns to thereby smooth the detected patterns. to thereby smooth the detected patterns.

21. The printer according to claim 20,
10 wherein said scale-varying processor unit magnifies the size of the original image to a predetermined image size according to pixel-interpolation, and then reduces the magnified image size to the predetermined image size by performing the pixel-15 removal processing.

22. The printer according to claim 20,
wherein said scale-varying processor unit detects a gradient variation of a pixel-removal-candidate attention pixel with respect to peripheral pixels,
20 does not perform pixel-removal processing when the gradient variation is relatively great, and performs pixel-removal processing when the gradient variations are relatively small.

23. The printer according to claim 20,
25 wherein said scale-varying processor unit defines a matrix having a predetermined size for a pixel-removal-candidate attention pixel, calculates the

sum of absolute values representing the difference between the pixel-removal-candidate attention pixel and peripheral pixels belonging to the matrix as a gradient variation amount, does not perform the

5 pixel-removal processing when the gradient variation amount is equal to or greater than a predetermined threshold, and performs pixel-removal processing when the gradient variation amount is less than the threshold.

10 24. The printer according to claim 20,
wherein said scale-varying processor unit does not
perform remove a removal-candidate pixel either
when the level of the removal-candidate pixel is
bright, and the overall tone of peripheral pixels
15 thereof is dark; or when the level of the removal-
candidate pixel is dark, and the overall tone of
peripheral pixels thereof is bright.

25. The printer according to claim 20,
wherein said image-quality corrector unit inputs
20 the black and white pixel data representing groups
of an attention pixel and a plurality of peripheral
pixels, and performs comparison of the input data
to the irregular patterns registered; and when
pattern-matching is detected, said image-quality
25 corrector unit performs area gradation correction
for converting an area at a predetermined position
in an n-divisional pixel (n = natural number) of

the attention pixel and a predetermined number of intrapixel divisional areas to black areas.